

To what extent do university-industry collaborations entail a two-way flow of knowledge? An empirical investigation of UK manufacturing and service companies"

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Research Topic

A crucial tenet of the Triple Helix analytical framework is that interactions oriented to the co-production of knowledge between universities, businesses and government agencies are instrumental in leveraging the innovative potential of economic systems (Etzkowitz and Leydesdorff, 2000). One of the potential benefits from university-business research collaborations is the contribution of businesses in bringing complementary expertise and inspiring new avenues for academic research (Gibbons and Johnston, 1974; Branscomb et al., 1999). Indeed, an increasing number of government initiatives are put in place to attenuate systemic failures based on the argument that favourable institutional arrangements are required to facilitate the co-production of knowledge between universities and businesses (Poyago-Theotoky et al., 2002).

However, while much of the public support of university-business research collaborations is based on the two-way flow of knowledge between these two types of partners, little is known about the factors that are more conducive to the active contribution of businesses to knowledge generation. In this research we aim at shedding some light on this neglected issue by investigating two questions: (i) among businesses collaborating with universities, what are the conditions that favour businesses actively contributing to the co-production of knowledge (as opposed to "simply" being recipients of knowledge generated by universities); and (ii) to what extent manufacturing and services businesses exhibit systematic differences in their contribution to the co-production of knowledge.

The first question is examined by analysing the factors influencing businesses' decision to actively contribute to co-production of knowledge. First, the type of knowledge exchanged: we hypothesise that the more tacit is the knowledge exchanged, the more likely the company is an active knowledge contributor (Bierly et al., 2009). Second, the degree of organisational convergence: we hypothesise that knowledge co-production is positively influenced by the experience of firms in establishing formalised contracts with universities, and the proportion of employees with graduate degrees (Hagedoorn and Schakenraad, 1994). Third, the orientation to exploration: we hypothesise that firms with a more exploratory orientation are more likely to actively participate in co-production of knowledge (Berkovitz and Feldman, 2007). Finally, the type of university partner (i.e. top-ranked university departments): we hypothesise that interacting with top quality research partners require a more active engagement of businesses in two-way flows of knowledge (Ponds et al., 2007).

The second question is addressed by examining the profile of two groups of firms: high-tech manufacturing firms (HTMs) and knowledge-intensive business services (KIBS). We compared these two groups with respect to: a) the frequency in which businesses engage in contributions to knowledge; b) the extent to which businesses engage in the exchange of tacit knowledge; and c) the extent to which businesses have a more exploratory orientation in their partnerships with universities. By examining this, our aim is to identify whether manufacturing and services share a common profile in their pattern of collaboration or exhibit systematic differences.

Methods/Data

The data used in this paper is based on a survey of businesses that participated in research collaborations with universities. The sampling frame has been the records of grants awarded by the Engineering and Physical Sciences Research Council (EPSRC) over the period 1999. This sampling strategy resulted in a frame list of 3119 businesses, covering both manufacturing and services. The survey was conducted between November 2007 and February 2008, and a total of 602 valid questionnaires were returned (19% response rate).

The questionnaire included a section of particular interest for this paper, where firms are asked to report how important was their contribution to knowledge in the context of their collaborations with universities (i.e. contributing with 'ideas for research projects').

For the first part of the analysis, ordered Logistic Regressions were conducted to examine the extent to which businesses contribution to knowledge in the context of the research projects in which they participated were significantly correlated with the factors mentioned above. For the second part of the analysis, we stratified our sample of responding businesses by aggregated industry sectors, and comparing the profiles of four groups of firms: HTMs, KIBS, other manufacturing firms and other service firms.

Results

The results show that (i) the more tacit the knowledge exchanged, (ii) the more experienced businesses are in formalised contracts with universities, and (iii) the more oriented towards exploration, the more likely they substantially contribute to co-production of knowledge. However, we did not find a significant relationship for business absorptive capacity and for the interaction with top-ranked departments.

Our findings also point out that, while both HTMs and KIBS are particularly likely to actively contribute to a two-flow of knowledge with their university partners, they display distinct profiles with respect to the type of knowledge exchanged and the orientation towards exploration.

We believe that the paper contributes to uncover the conditions favourable to two-flow knowledge exchanges between universities and businesses; and second, it sheds new light on the distinct role of manufacturing and services in their patterns of interactions with universities.

References:

- Bercovitz, E.L.J. and Feldman, M.P. (2007): "Fishing upstream: firm innovation strategy and university research alliances", *Research Policy*, 36:930-948.
- Bierly III, P.E., Damanpour, F. and Santoro, M.D. (2009): "The application of external knowledge: organizational conditions for exploration and exploitation", *Journal of Management Studies* 46(3):481-509.
- Branscomb, L.M., Kodama, F. & Florida, R. (1999): *Industrializing Knowledge: University-Industry Linkages in Japan and the United State*. Massachusetts: MIT Press.
- Etzkowitz, H. & Leydesdorff, L. (2000): "The dynamics of innovation: from National Systems and 'Mode 2' to Triple Helix of university-industry-government relations", *Research Policy* 29:109-123.
- Gibbons, M. and Johnston, R. (1974): "The role of science in technological innovation", *Research Policy* 3:220-242.
- Hagedoorn, J. and Schakenraad, J. (1994): "The effect of strategic technology alliances on company performance", *Strategic Management Journal* 15:291-311.
- Ponds, R., van Oort, F. and Frenken K. (2007): "The geographical and institutional proximity of research collaboration", *Papers in Regional Science* 86(3):423-443.
- Poyago-Theotoky, J., J. Beath and D.S. Siegel (2002). Universities and fundamental research: reflections on the growth of university-industry partnerships, *Oxford Review of Economic Policy* 18(1):10-21.

